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The long-disputed questions as to the ancient bed of the Amu Daria, or Oxus, appear to have received a final settlement in the publication of the studies of Konshin of St. Petersburg. According to him, the river has never directly emptied into the Caspian; but it is probable that at some period an indirect communication has existed between them through Sari-Kamich Lake and the Uzboi, which drained it. The lake was of much greater area, and its overflow reached the Caspian by the Uzboi: its character was saline or brackish. Were this state of things restored, we should have an immense Turanian sea, composed of a northern basin corresponding to that of the Sea of Aral, and a southern one corresponding to the Sari-Kamich area, connected by a wide but shallow neck of water. Into the former the Sir-Daria would empty, with the Sari-Su and the Chiu; into the latter, the Oxus, the Tedient, and the Murgháb. The overflow of brackish water would find its way by the Uzboi to the Caspian.

Those interested in the question of lakes with two outlets would do well to incite exploration of Frances Lake in the North-west territory. This lake, discovered many years ago by Robert Campbell, now of Winnipeg, was reached by him from the head waters of the Liard River, ascending, according to his account, a small stream actually proceeding from the lake. To his surprise, on the other side he found a communication, during the time of high water, with the head waters of the Pelly River. In 1865 information received from officers of the Hudson-Bay company at Victoria, by those of the International telegraph expedition, was to the effect that the Pelly communication was the chief one, and that a lowering of its bed had turned the drainage permanently north-westward, and the connection with the Liard had become nearly or entirely dry. This has since been indicated on most charts; but, as the lake covers some four hundred and fifty square miles, fuller and confirmatory evidence would be very desirable. The Liard is an affluent of the Mackenzie, and the Pelly of the Yukon River.

THE STATE SURVEY OF NEW YORK.

THE veto of the appropriation for this survey by the late governor of New York caused only a partial suspension of its functions. The survey exists by reason of an organic law creating the commission, and defining its powers. Only by the repeal of this law can the survey be abolished. Its work has been confined to a triangulation so accurately executed as to form a reliable basis for all local surveys and topographical work; but the value of such careful measurements is somewhat difficult for the unscientific man to understand, and the results are not immediately apparent.

To remove all doubts regarding the excellence and economy of the work under their control, the commissioners requested an investigation by the U. S. coast and geodetic survey. After a full examination

of the records of eight years' work, Superintendent Hilgard transmitted them to the state authorities, with his full indorsement.

By this appeal to a most competent authority, the commissioners and director of the New-York state survey have established the fact that the work slowly accomplished with small appropriations since 1876 has been done in the best way and at a small cost. Their report just made to the legislature, having vindicated the work of the past, recommends a radical change in the future policy of the survey. It is urged that New York should be warned by the experience of Massachusetts that a triangulation not immediately followed by a detailed topographical survey gives but little satisfaction to the people. The citizens of a state want reliable maps which they can use, not mere skeleton maps which are only available for surveyors. The board therefore recommends that the legislature enlarge its powers, and increase the appropriations for the state survey, so that topographical surveys may be at once begun in at least three counties, and be carried forward on such a scale as to permit of the economical performance of the work. The cost of the topographical work is estimated at from ten dollars to twenty dollars per square mile, depending upon the character of the country, and the scale of expenditure recommended is forty thousand dollars per annum. For this sum, complete maps of from three to five counties could be made each year, and the maps, by counties, issued within a year after the field-work is done. It is proposed to have the U. S. coast and geodetic survey complete the primary and secondary triangulations, leaving the funds of the state to be used for tertiary triangulation and topographical work.

The experience of the director of the survey, who is by law the engineering member of the state board of health, has proved conclusively the wide-spread need of topographical maps to aid in the sanitary work of the state. The commissioners therefore affirm that there is pressing necessity for topographical maps for sanitary works on water-supplies and drainage; that no survey can meet the wants of the people that does not result in a reliable map sufficiently detailed for ordinary practical and scientific purposes; and that the people have a right to expect that the benefits of the survey will be made immediately available in the form of useful maps.

PROPOSED NEW METHOD OF MEASURING THE DENSITY OF THE EARTH.

THE only known way of measuring the density of the earth is through the 'gravitation constant,' which expresses the attraction exerted by a known mass at a given distance. The bodies whose attractions have been measured are either mountains or portions of the earth, as in the well-known experiments of Maskelyne and Airy; or portable masses of lead, as used by Bailey and others. The difficulty in the way of the former experiments is the necessary uncertainty of the density of those portions of the earth's mass in

and below a mountain, or within any other extended region. The difficulty in the way of utilizing the masses of lead is the extreme minuteness of the attraction exerted by any manageable mass. On the whole, however, the latter method, in the hands of Bailey, Reich, and others, has been the more reliable of the two. A few years since, the late Professor Von Jolly of Munich undertook to measure the attraction of a globe of lead about one metre in diameter, upon a weight in the pan of a balance. The arm of the balance was at a height of twenty-one metres over the leaden globe, and the pan which held the weight was suspended by a wire of that length. It was balanced by a weight in the other pan immediately below the balance, so that the attraction was exerted only upon one weight.

A modification of Jolly's method was recently described in a paper read before the Berlin academy of sciences, by Arthur König and Franz Richarz. These gentlemen propose the following modification of the long suspension. They will cast a great block of lead in the shape of a parallelepiped. On the horizontal surface of this block will be placed an ordinary balance, the scales of which shall swing very near the surface. A vertical hole will be bored through the block, directly under the point of suspension of each scale of the balance; and a second pair of scale-pans will be suspended below the block by wires attached to the upper scale-pans, and passing through these openings. Thus the balance will consist of two pairs of scale-pans, — one pair below, the other above, — with the leaden mass between them. The masses whose attraction is to be measured will be placed, the one in the upper, and the other in the opposite, lower, pan of the scales. The attraction of the block will make the lower one lighter, and the upper one heavier. The positions will then be changed by removing the weight in the lower pan to the pan immediately above it, and *vice versa*. Then the attraction of the block will make heavier the weight which was before lighter, and *vice versa*, thus causing a difference in the weights amounting to four times the attraction of the block.

It is proper to add that this weighing method is subject to a good deal of criticism. So far as we are aware, its original inventor was Mr. C. S. Peirce, who proposed to utilize the Hoosac tunnel for the purpose, — to bore a hole from the surface of the earth vertically to the tunnel, and use it for the passage of a wire to hold a weight supported by a balance at the surface. It was found, however, that the air-currents, and other sources of disturbances, were such as to render the method inapplicable. It is difficult to see how Von Jolly's apparatus could have been free from the same difficulty. The attraction of his leaden sphere could only have been one five-millionth part of the weight, — a fraction which is about the extreme limit with which it is possible to effect a weighing under the most favorable conditions. With a block of any manageable size, the attraction by the method of König and Richarz will hardly reach a millionth part of the weight. Still the authors are making arrangements to execute their experiment, and physicists will look with interest for its result.

THE PREHISTORIC CONGRESS AT LISBON.

THE prehistoric studies in Portugal of the late lamented Carlos Ribeiro have already been brought to our readers' notice (*Science*, Dec. 14, 1883). He was the leading spirit at the Lisbon congress, as well as its general secretary; and his long illness dating from that time, and his death, which took place Nov. 13, 1882, account for the delay in the appearance of this long-expected official report. It has now been given to the world in the most satisfactory manner, with beautiful typography and ample illustrations, under the charge of Sig. Delgado, who has succeeded to the position of director of the Geological bureau of Portugal. The freshness of it, however, is somewhat impaired, owing to the full *résumé* of the proceedings, that was given by Cartailhac in the *Matériaux*, November and December, 1880, and by Professor Bellucci, at even greater length, in *L'archivio per l'antropologia, e l'etnologia*, vol. xi. fasc. 3.

It was understood that the chief interest of this congress would centre about the discussion of the first question proposed: "Are there any proofs of the existence of man in Portugal during the tertiary epoch?" Ribeiro and the Portuguese geologists desired that foreign geologists and prehistoric archeologists should visit and thoroughly study at least one of the localities from which the supposed tertiary flints had mainly come. All this was accomplished, and the results are already well known. An excursion (somewhat of the nature of a picnic) was made to 'the desert of Otta,' about thirty miles north of Lisbon, where Professor Bellucci of Perugia found *in place*, in a miocene deposit, a flint flake with a well-marked 'bulb of percussion.' This was seen by several witnesses before it was detached, and by many experts was pronounced to be of undoubted human origin. To the writer, however, the engraved figure of it does not appear entirely convincing. Upon their return, the series of flint objects discovered in this locality by Ribeiro, during the past twenty years, was submitted to the judgment of a commission of nine experts. Their report, and the discussion that ensued thereupon, developed a great difference of opinion. Upon the geological question all were in accord with the Portuguese geologists, that the locality was the shore of a miocene lake. In regard to the archeological

Congrès international d'anthropologie et d'archéologie pré-historiques. Compte rendu de la neuvième session à Lisbonne, 1880. Lisbonne, Typographie de l'Académie royale des sciences, 1884. 49 + 723 p., 44 pl. 8°.